

Patent Claims

1. A method for producing an annular element comprising an inner toothing, especially a sliding sleeve, wherein an outlet ring element (10) can be arranged in an extrusion device (90) which comprises an annular matrix element (13) with an inner bore hole (12), a sleeve stamping device which is arranged therein and comprises a first (15) and a second (17) annular sleeve stamping element which can be moved in relation to each other in the inner bore hole (12), and an inner stamping device comprising a first (19) and a second (21) inner stamping element and first (27") and second (27') partial regions which are interspaced in the circumferential direction; when the inner stamping device is closed, said partial regions form cavities (27) for producing the inner toothing; the outlet ring element (10) is arranged between the first and second inner stamping elements (19, 21) and is measured in such a way that when closing the sleeve stamping device, material from the outlet ring element (10) flows into the cavities (27) for the formation of the inner toothing.
2. A method according to Claim 1, wherein an element in the form of a forged blank is used as the outlet ring element (10).
3. A method according to Claim 2, wherein the blank is blasted and annealed.
4. A method according to one of Claims 1 to 3, wherein the first inner stamping element

(19) and the second inner stamping element (21) have toothings (23) that become meshed together so that the first inner stamping element (19) and the second inner stamping element (21) are brought into an exact axial and circumferential direction in relation to one another.

5. A method according to one of Claims 1 to 4, wherein the first partial region (27'') is designed and used to form the straight-cut toothing and roof-shaped toothing of a toothing element (5) of the inner toothing, and a second partial region (27') is designed and used to create a roof-shaped toothing of a toothing element (5) of the inner toothing.
6. A method according to one of Claims 1 to 5, wherein the outlet element (10) is arranged between the pressing surfaces (16) of the first stamping element (15) and the second stamping element (17), which are arranged transversely to the longitudinal axis (LA).
7. A method according to one of Claims 1 to 6, wherein the inner diameter (D_i), the outer diameter (D_a) and the axial length (L_1) of the outlet ring element are measured in such a way that when closing the sleeve stamping device, the outlet ring element (10) is shortened on one end (L_2) so that the material that is thereby displaced flows into the cavities (27).
8. A method according to one of Claims 1 to 7, wherein when closing the sleeve stamping device, the position of the first sleeve stamping element (15) or the second sleeve stamping device (21) remains static in its position

and the second sleeve stamping device (21) or the first sleeve stamping device (15) is moved.

9. A method according to one of Claims 1 to 8, wherein the method is carried out while the temperature of the outlet ring element (10) is between ambient temperature and approximately 1200°C, preferably between approximately 1000°C and 1200°C.
10. A method according to one of Claims 1 to 9, wherein the overflowing material and/or burrs created during the production of the annular element are removed by means of deburring.
11. A method according to one of Claims 1 to 10, wherein phosphate layers and/or rust is removed from the annual elements by means of debonders.
12. A method according to one of Claims 1 to 11, wherein an additional extrusion device (100) is used to produce undercuts (11) in the toothing elements (5) of the inner toothing, said extrusion device (100) having a stamping element (103) with multiple divisions in the circumferential direction that concentrically surround a die insert (105); said stamping element (103) comprising annulus elements (104) that can be moved in a radial direction and that have at least one protrusion (144) extending inward in the radial direction and grooves (150) running in the axial direction for accepting the toothing elements (5) of the straight-cut toothing in order to produce an undercut (11) in the toothing elements (5), wherein the die insert (105) is moved axially inside the annulus elements (104) so that the annulus elements (104) are moved radially outward in such a way that

a conically tapering bevel (140) of the die insert (105) is supported by beveled surfaces (144) of the annulus elements (104) that are on an incline in relation to the die insert (105); said annular element with an inner toothing, together with the annulus elements (104) of the stamping element (103) that are moved radially outward, are moved over an ironing region (107) of a matrix element (101) while being supported on a shoulder (147) of the annulus elements (104), wherein the outer diameter of the annular element decreases and the material that is thereby displaced flows radially into the grooves (150) of the annulus elements (104) of the stamping element (103) and transforms to the shape of the protrusions (144).

13. A method according to Claim 12, wherein the die insert (105) is moved axially from the area of the annulus elements (104) in order to remove the annular element of the die insert (105) from the mold, wherein the conically tapering bevel (140) of the die insert (105) disengages from the beveled surfaces (144) of the annulus elements (104) and said annulus elements move radially inward so that the undercuts (11) are released from the protrusions (144) and the annulus elements (104) are moved from the area of the annular element.
14. A method according to Claim 13, wherein an ejector (102) is arranged in the inner opening (155) of the matrix element (101), by means of which the finished annular element can be ejected via the ironing area (107) after being released by the stamping element (103).

15. A method according to Claim 13 or 14, wherein an energy storage (137) is provided that automatically moves the annulus elements (104) axially out of the area of the annular element when the grooves (140) with the protrusions (144) release the corresponding toothing elements (5) with the undercuts (11).
16. An extrusion device for carrying out the method according to one of Claims 1 to 11, comprising an annular matrix (13) with an inner bore hole (12), a sleeve stamping device which is arranged therein and comprises a first (15) and a second (17) annular sleeve stamping element which can be moved in relation to each other in the inner bore hole (12), and an inner stamping device comprising a first (19) and a second (21) inner stamping element and first (27") and second (27') partial regions which are interspaced in the circumferential direction; when the first (19) and a second (21) inner stamping elements of the inner stamping device are closed, said partial regions form cavities (27) for producing the inner toothing; the outlet ring element (10) is arranged between the first and second inner stamping elements (19, 21) and is measured in such a way that when closing the sleeve stamping device, material from the outlet ring element (10) flows into the cavities (27) for the formation of the inner toothing.
17. A device according to Claim 16, wherein the first inner stamping element (19) and the second inner stamping element (21) have toothings (23)

that become meshed together so that the first inner stamping element (19) and the second inner stamping element (21) are brought into an exact axial and circumferential direction in relation to one another.

18. A device according to Claim 16 or 17, wherein the first partial region (27") is designed and used to form the straight-cut toothing and roof-shaped toothing of a toothing element (5) of the inner toothing, and a second partial region (27') is designed and used to create the upper toothing of a toothing element (5) of the inner toothing.
19. A device according to one of claims 16 to 18, wherein the first sleeve stamping element (15) and the second sleeve stamping element (17) have pressing surfaces (16) running transversely to the longitudinal axis (LA), between which the outlet element (10) can be arranged.
20. An extrusion device for carrying out the method according to one of claims 12 to 15 used to produce undercuts (11) in the toothing elements (5) of the inner toothing of an annular element, wherein said extrusion device comprises a stamping element (103) with multiple divisions in the circumferential direction that concentrically surround a die insert (105); said stamping element (103) comprising annulus elements (104) that can be moved in a radial direction and that have at least one protrusion (144) extending inward in the radial direction and grooves (150) running in the axial direction for accepting the toothing elements (5) of

the inner toothing in order to produce an undercut (11) in the toothing elements (5), wherein the die insert (105) is moved axially in the annulus elements (104) so that the annulus elements (104) are moved radially outward in such a way that a conically tapering bevel (140) of the die insert (105) is supported by beveled surfaces (144) of the annulus elements (104) that are on an incline in relation to the die insert (105); said annular element with an inner toothing, together with the annulus elements (104) of the stamping element (103) that are moved radially outward, are moved over an ironing region (107) of a matrix element (101) while being supported on a shoulder (147) of the annulus elements (104), wherein the outer diameter of the annular element decreases and the material that is thereby displaced flows radially into the grooves (150) of the annulus elements (104) of the stamping element (103) and transforms to the shape of the protrusions (144).

21. A device according to Claim 20, wherein an ejector (102) is arranged in the inner opening (155) of the matrix element (101), by means of which the finished annular element can be ejected via the ironing region (107) after being released by the stamping element (103).
22. A device according to Claim 20 or 21, wherein an energy storage is provided that automatically moves the annulus elements (104) axially out of the area of the annular element when the grooves (140) with the protrusions (144) release the corresponding toothing elements (5) with the undercuts (11).